

**The City of Calgary  
2003 Corporate Greenhouse Gas Emission Inventory**

**January 2005**

**Prepared for:  
The Federation of Canadian Municipalities &  
ICLEI – Local Governments for Sustainability  
Partners for Climate Protection Program**

**Produced by:  
The City of Calgary  
Environmental Management Business Unit**

## Report Highlights

- ▶ **The City of Calgary has committed to reducing its corporate GHG emissions to 6% below the 1990 level by 2012.**
- ▶ **The City of Calgary's EnviroSystem - ISO14001 Environmental Management System - identifies GHG emissions as one of seven corporate-wide operational environmental priorities.**
- ▶ **The emission accounting and reporting protocol used in this report is in accordance with those recommended by the FCM/ICLEI- Local Governments for Sustainability Partners for Climate Protection (PCP) program.**
- ▶ **The City of Calgary has developed and implemented a proprietary automated computer data collection system – greenHouse gas Emissions & Abatement Tracking (HEAT) which will enable annual reporting of corporate GHG emissions beginning in 2003.**
- ▶ **Based on PCP greenhouse gas emission accounting protocol, data for 2003 indicates City of Calgary corporate GHG emissions have declined. Corporate emissions have decreased by 4.2 kt from 1990 levels - a 1% absolute decrease. Moreover, emissions have decreased more dramatically from 2000 – declining by 28 kt or over 6%.**
- ▶ **The City's success in reducing corporate GHG emissions below the 1990 level can primarily be attributed to three large-scale program initiatives, including: Energy Performance Contracting (EPC), EnviroSmart Streetlight Retrofit and LED Traffic Signal Replacement. It should be added that numerous smaller scale initiatives have also contributed to reducing corporate GHG emissions.**

## Introduction

This report provides an inventory of The City of Calgary's greenhouse gas (GHG) emissions for the 2003 calendar year; and has been specifically prepared to meet the GHG emission accounting protocol of the PCP program. The GHG emissions identified in this report are those that are released as a result of The City of Calgary's corporate operations. These sources include The City's vehicle fleet, buildings and water and wastewater treatment facilities, but exclude emissions associated with public transit sources (as per the PCP's protocol). In this regard, the emission figures reported in this document differ slightly from those used by The City of Calgary in its official internal reports and council reports.

## Mandate for Action on Climate Change

In June 2000, City Council directed the Administration to establish a municipal climate change program. Subsequently, in January 2002, Council approved the "Carbon Dioxide Emissions Abatement Action Plan", which committed The City of Calgary to reducing its corporate GHG emissions to 6% below the 1990 level by 2012. In June 2004, Council reaffirmed its support for this objective when it approved the **2004 Corporate Climate Change Action Plan**. Furthermore, EnviroSystem, The City of Calgary's ISO14001 Environmental Management System, identifies GHG emissions as one of seven corporate-wide operational environmental priorities. These priorities are environmental issues that span most business units in the corporation.

Additionally, as a member of the Federation of Canadian Municipalities' Partners for Climate Protection, The City of Calgary has committed to reduce local GHG emissions and improve the local environment and quality of life.

## New Reporting Commitment

Historically, the collection of GHG emissions data has been an extremely onerous exercise, in terms of time and staff resources, due to the fact that it had to be collected via "manual" review of all utility and fuel bill statements. The manual collection of data for any given year was found to require approximately three years of effort. Therefore, there has been a considerable gap (3 years) since The City of Calgary last recorded and reported on its corporate GHG emissions. This situation has been addressed through the development of a proprietary automated computer data collection system – greenHouse gas Emissions & Abatement Tracking (HEAT) - designed by The City's Information Technology business unit in cooperation with the Environmental Management business unit.

With the full implementation of the HEAT emission reporting system in mid-2004, The City of Calgary has committed to a new **annual** GHG reporting regimen, which will

enable the production of annual corporate GHG emission reports within 6-8 months of year end. This 2003 report is the inaugural **Annual Corporate GHG Emission Inventory** using data generated by HEAT.

## City of Calgary Corporate GHG Emissions Target

As stated in the *Mandate for Action on Climate Change* section of this report, City Council has established a corporate GHG emission target of an absolute reduction of 6% from the 1990 emission level, to be achieved by 2012.

## GHG Emission Framework

The City's corporate GHG emissions are organized into five general categories, including; *buildings, fleet, streetlights, water and wastewater operations and other*. The HEAT data collection system has been designed to capture and report on corporate emissions based on these five categories of emission sources:

1. **Buildings** – includes all GHG emissions associated with energy consumption to heat and light structures and operate equipment powered by energy sourced from those structures.
2. **Fleet** – includes all GHG emissions produced by off and on-road vehicles in The City's vehicle fleet, but excludes The City's public transit fleet emissions and emission reduction measures, as per the PCP's municipal government emission accounting protocol.
3. **Streetlights** – includes all GHG emissions associated with the energy required to power The City's streetlight and traffic light systems.
4. **Water and Sewer Operations** – includes all GHG emissions associated with the energy consumed to operate The City's wastewater and water treatment facilities and distribution networks.
5. **Other** – catch-all category that includes GHG emissions associated with waste materials generated by City operations, employee travel in private vehicles and miscellaneous/one-time occurrences.

## 2003 Corporate GHG Emissions

The year 2003, represents a "watershed" year for The City of Calgary's Climate Change Program, as it is the first reporting year that "captures" the results of The City's efforts to reduce its GHG emissions, which really did not begin in earnest until 2002, when the Energy Performance Contracting and EnviroSmart Streetlight Retrofit initiatives were launched. Based on PCP emission reporting protocol, data for 2003 reveals that City of Calgary GHG emissions have started to decline. Emissions have decreased by 4.2 kt

from 1990 levels - a 1% absolute decrease. Moreover, emissions have decreased even more dramatically from 2000 – declining by 28 kt or over 6% (see Table 1).

**Table 1**

<b>City of Calgary GHG Emissions 1990 to 2003</b>				
<b>Emission Source</b>	<b>1990 (kt)</b>	<b>2000 (kt)</b>	<b>2003 (kt)</b>	<b>% Change 1990-2003</b>
Buildings	208.3	208.8	197.1	(-5.4)
Fleet	31.5	36.4	33.5	6.3
Streetlights	80.6	86.6	76.0	(-5.7)
Water & Sewer Operations	104.6	110.5	114.0	9.0
Other <sup>1</sup>	6.7	13.1 <sup>2</sup>	6.8	1.5
<b>TOTALS</b>	<b>431.7</b>	<b>455.5</b>	<b>427.5</b>	<b>(-1.0)</b>

<sup>1</sup> Includes: waste generated by employees and employee travel.

<sup>2</sup> Includes: All listed above and one-time use of diesel engine generation of electricity (7.8 kt).

Note: The above City of Calgary corporate GHG emissions data have been adjusted to remove public transit related emissions, as per FCM/ICLEI reporting protocol. The official City of Calgary GHG inventory includes Calgary Transit (public transit) emissions (see "Corporate EnviroSystem 2004 Fourth Quarter Reporting Summary" for The City's GHG emissions as reported to City Council).

Note: Totals vary from sum of constituent numbers due to rounding.

The City's success in reducing 2003 corporate GHG emissions to 1% below the 1990 level can primarily be attributed to three large-scale program initiatives, including: Energy Performance Contracting (EPC), EnviroSmart Streetlight Retrofit and LED Traffic Signal Replacement (see Attachment 1 for program details).

## **Analysis of GHG Emission Sources**

### **1. Buildings**

The impact of the Energy Performance Contract (EPC) initiative - The City's Building energy efficiency retrofit program, initiated in 2002 – is clearly demonstrated in the decrease in GHG emissions from City buildings and facilities. Between 1990 and 2003, GHG emissions decreased by 5.4% (11.2 kt). Electricity and natural gas consumption for space and water heating, decreased despite the increase in the number of City facilities over this time frame. This is a clear indication of the increase in efficiencies being achieved by the EPC effort.

### **2. Fleet**

From 1990 and 2003, City fleet emissions increased by 6.3% (2.0 kt). The City's fleet is comprised of about 3,170 vehicles, consisting of 2,200 general use vehicles, 800 Police Services vehicles, and 170 Calgary Fire Department vehicles. The fuel used by the 950 Calgary Transit vehicles is not included in this GHG inventory. Therefore, Calgary Transit's "Ride the Wind" program, which changed the power source of the Light Rail Transit system fossil fuel derived electricity to zero emission wind derived electricity, is not credited in this inventory.

### 3. Streetlights

The impact of the EnviroSmart Streetlight Retrofit and LED Traffic Signal replacement programs are reflected by the 5.7% decrease in GHG emissions from the “Streetlights” category. Given that at the end of 2003, less than 50% of their combined total impact on emissions had been realized, it is anticipated that these programs will contribute additional emission reductions over the next two years.

### 4. Water & Sewer Operations

From 1990 to 2003, emissions from water and sewer operations increased by 9%. The magnitude of this increase was not unexpected given the fact that potable water production increased from 154.7 billion litres to 177.7 billion litres (15%) and treated wastewater increased from 155.5 billion litres to 164.7 billion litres (6%) over the same time span.

It should be noted that GHG emissions per unit of water produced and wastewater treated have decreased slightly since 1990. With regard to potable water production, from 1990 to 2003 GHG emissions per million litres produced have declined by 3.7% from 375 kg to 361 kg; and for wastewater, emissions per million litres treated decreased by about 1% during the 1990 to 2003 timeframe from about 306 kg in 1990 to 302.6 kg.

### 5. Other

From 1990 to 2003 emissions from the catch-all “others” category was essentially flat (1990: 6.7 kt and 2003: 6.8 kt). Note that the significant increase to 11.2 kt in 2000 was essentially a one-time occurrence due to The City producing electricity from diesel powered back-up generators to sell into the Alberta grid during the year 2000 electricity shortage. Urban Forest “carbon sink” estimate is not used in this report, in accordance with the PCP’s recommended GHG emission accounting protocol.

## Future Directions & Opportunities

Significant, long-term projects are presently underway in the “Buildings” (EPC), “Streetlights” (EnviroSmart & LED signals) and “Water & Waste Water Operations” emission categories. These efforts will continue to deliver emission reductions over the next several years as they proceed towards completion. The “Other” category, in terms of total emissions and proportion of corporate emissions, offers little opportunity for significant future emission reductions. Therefore, the “Fleet” represents the best immediate opportunity to pursue future additional emission reductions.

The potential exists to reduce Fleet emissions through “Right-sizing” and “Best-in-class” purchasing policies, purchase of hybrid electric units and use of biofuels (as identified in The City’s 2004 Climate Change Action Plan). However, the extent to which reductions

can be achieved by the Fleet is dependent upon financial resources and technological advancements. As well, there is an opportunity to reduce Water & Sewer Operations emissions through water conservation programs, facility energy efficiency efforts and application of new technologies (much of which is already being undertaken by The City's Waterworks and Wastewater business units).

## Attachment 1

### Major City of Calgary GHG Emission Reduction Programs

#### ▶ **Energy Performance Contracting Program (EPC)**

EPC is an innovative partnership with private energy service firms that will improve the energy efficiency of City buildings and facilities at zero net cost. This is achieved by using financial savings accrued from using less energy and using it to repay the energy service company over a 10 year term. Thus far, work has been initiated or completed on about half the buildings subject to the program, including: The City's transportation facilities, Manchester Yards, ENMAX/Alberta Trade Centre, Corporate Properties, Waste and Recycling facilities and Calgary Fire Department facilities.

Upon project completion, it is estimated The City will realize \$7 million in energy cost savings per year.

#### ▶ **EnviroSmart Streetlight Retrofit Program**

City streetlights are being retrofitted with lower-wattage, flat lens fixtures. In total, 37,500 streetlights will be impacted by the program, which was initiated in 2002. By the end of 2003, about 20,000 streetlights had been retrofitted.

Upon project completion, it is estimated The City will realize \$1.7 million in energy cost savings per year.

#### ▶ **LED Traffic Signal Replacement Program**

LED technology is being used to replace incandescent lights at 730 intersections located throughout Calgary. The project will take three years to complete. It was initiated in March 2003. By the end of 2003 about one-third of the project was completed.

Upon completion, it is estimated The City will save \$670,000 annually in electricity costs, and project costs will be completely recouped in five years.

**Attachment 2**  
**Fuel Coefficients**

<b>Fuel Coefficient</b>	<b>Value</b>	<b>Units</b>	<b>Source</b>
Gasoline	2.479	kg CO <sub>2</sub> e/L	TEAM SMART Dec 2002 - average of light-duty gas automobile 3-way catalyst tiers, Table D-4
Diesel	2.757	kg CO <sub>2</sub> e/L	TEAM SMART Dec 2002 Table D-4 - using average of heavy-duty diesel vehicles numbers
Natural Gas (CNG) for vehicles	2.000	kg CO <sub>2</sub> e/L	TEAM SMART Dec 2002-Table D-4 Natural Gas vehicles
Propane	1.520	kg CO <sub>2</sub> e/L	TEAM SMART Dec 2002 - Table D-4 Propane Vehicles
Natural Gas	49.950	kg CO <sub>2</sub> e/GJ	TEAM SMART Dec 2002 - Table D-1 Natural Gas Energy for stationary combustion- Residential, Commercial, Agriculture
Methane - Global Warming Potential	21	N/A	Global Warming Potential - TEAM SMART Table D1
Electricity - year 2003	0.909	kg CO <sub>2</sub> e/kWh	2002 coefficient - ICLEI Greenhouse Gas Software for Local Governments (Torrie & Associates)
Electricity - year 2000	0.929	kg CO <sub>2</sub> e/kWh	City of Calgary CO <sub>2</sub> Emissions Abatement Action Plan, Part 2, Vol. 2 (p. 23) ICLEI-Energy Services
Electricity - year 1990	1.01976566	kg CO <sub>2</sub> e/kWh	City of Calgary CO <sub>2</sub> Data Collection Update (p. 25)

TEAM: Climate Change Technology Early Action Measures (TEAM) System of Measurement and Reporting to TEAM (SMART), TEAM Operations Office, December 2002.